

Cornea

1- Anatomy :-

2- Corneal ulcer (def - C.P - Ht).

3- Complication of Perforated Corneal ulcer

4- Fistula (diagnosis - I - (anagment)).

5- Hypopyon ulcer (def - Ht).

6- Keratoconus (Ht).

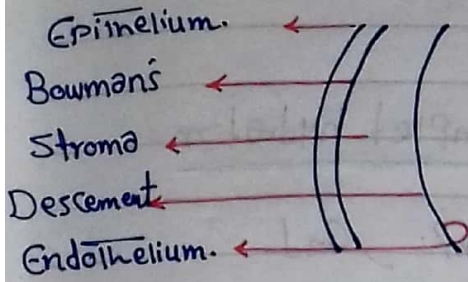
7- Dendritic ulcer (C.P - def - Ht).

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ABCDE

Layers of Cornea :- (Microscopic Anatomy).



[1] Surface Epithelium.

- basal layer of Columnar cell lying on basement membran.

- 2-3 layer of Poly hydral cell.

- 2 layer of Squamous non keratinized cells joined together by Tight junction.

→ Heals by Regeneration.

[2] Bowman's layer :-

- Acellular layer between ~~basal~~ Epithelium And Stroma.
- if destroyed can't Regenerate. Heal by scaring.
- stoped at limbus.

[3] Stroma :-

- Represent 90 % of Corneal Thickness.
- Formed of Regular Arranged layer of Collagen bundle. That Run Parallel to Corneal surface.
- layer Cross each other Perpendiculary.
- it Contain Kerato cyte.
- Heals by scaring.

[4] Descemet's Membran.

- Consider base ment membran of Endothelium.
- it elastic and Resistant to bacteria.
- Can Regenerate.

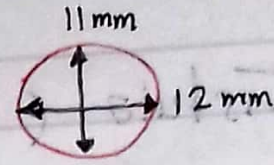


5 Endothelium:-

- single layer of flat hexagonal cell
- act as a pump Responsible for incomplete hydration of Cornea.
- Endothelial count about 4000 cell / mm². And.
decreases with age.
- less than 400 cell lead to corneal edema.
- Can't Regenerate.

N.B

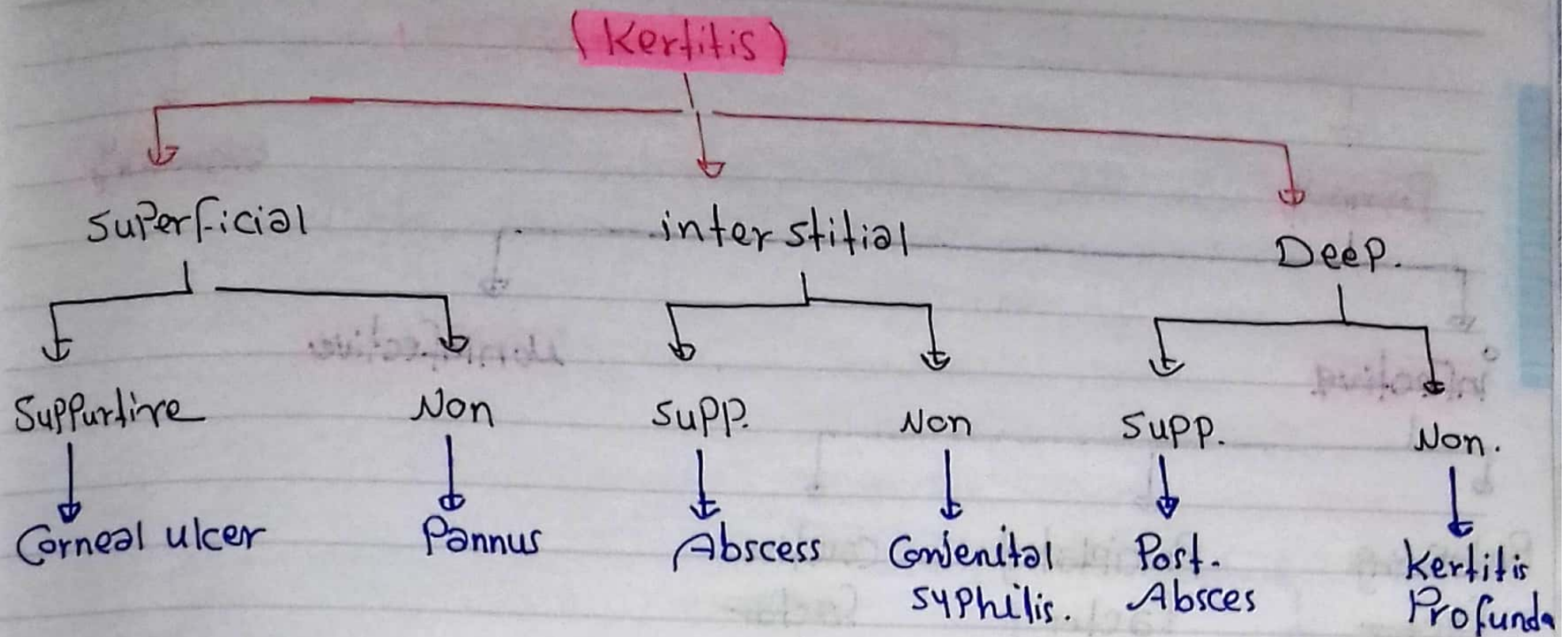
- Form Ant. $\frac{1}{6}$ of outer coat. of eye.
- Transparent Avascular Tissue: except ~~1~~ 1 mm at limbus.
- Refractive Power 42 D.
- Refractive index 1.37.
- Vertical Diameter 11 mm.
- Horizontal 12 mm.
- Thickness :-



Central $\rightarrow$ 0.6 mm

Prepheral $\rightarrow$ 0.7 - 1 mm

- Radius Curvature = 7.8 mm



Corneal ulcer

- def:-
- suppurative superficial keratitis.
 - localized necrosis in superficial layer of stroma accompanied by destruction of overlying epithelium.

Cause of Corneal ulcer

secondary

Primary

infective

Noninfective

Predisposing factor

Precipitating factor

Causative factor

local

General

- Bact.

- Viral

- Protozoa

- Fungal

Predisposing Factor

local

General

1. Traumatic Abrasion.

✓ Contact lens wear

✓ Trichiasis

✓ Finger nail

2. Toxic drug

3. Abuse use of steroid

4. lagophthalmos.

5. dryness of eye.

6. loss of Corneal sensation

1. D.M

2. old age.

3. vit. A deficiency.

4. immuno suppression.

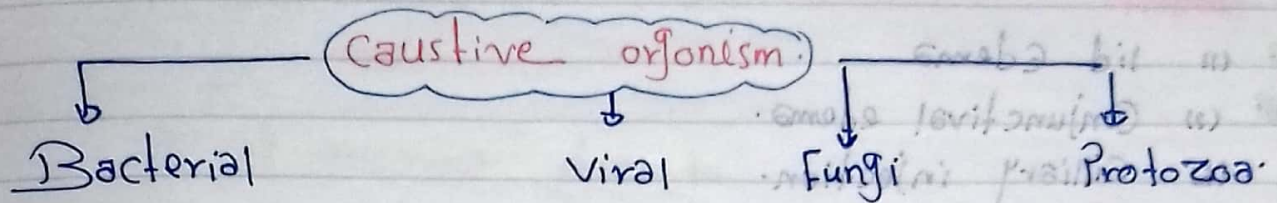
5. Male nutrition

6. Pregnancy.

Preceptating Factor

→ Infection of nearby structure. (source of infection).

- (1) Dacrocystitis
- (2) blephritis.
- (3) Conjunctivitis
- (4) sty.



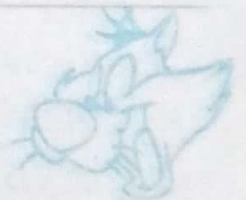
- Pneumo Cocci (most common)
- staph . Strept
- Morax Axenfeld
- Pseudo monus (Most serious).

- HSV
- HZV
- chlamydia
- Candida
- aspergillous (in contact lens).
- Acanthamoeba

→ bact. can invade intact Epithelium:

- ✓ Neisseria gonorrhea
- ✓ diphtheria
- ✓ listeria
- ✓ haemophilus egypticus.

NHAD
NHAL



Symptoms:-

1] Pain

- Pricking Pain.
- Increases with lid movement.

2] PLB

3] Defect of vision (if central).

4] Red eye

Sign:-

- Lid (1) lid Edema

- Con (2) Conjunctival edema.

(3) Ciliary injection.

- Cornea

(4) loss of luster

(5) Corneal edema

(6) +ve Fluorescein test

(7) grayish infiltration.

→ sign of associated uveitis.

(8) Tender ciliary body.

(9) Miosis

(10) AC show aqueous flare.

(11) Plasmoid aqueous.



Complication of Corneal ulcer

(A) Complication without Perforation:-

4/5

- 1- Secondary Glaucoma
- 2- Secondary iridocyclitis.
- 3- Slough (Descematocele)
- 4- Scar Formation.

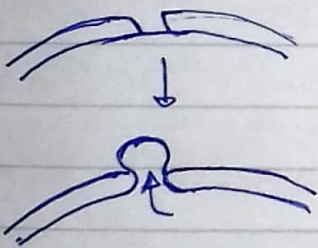
① 2nd glaucoma due to

- Plasmaoid aqueous and hypopyon. Result from iridocyclitis.
- Trabeculitis.

② 2nd uveitis with hypopyon.

③ Descematocele.

→ localized bulging of Descement membran. by effect of $\uparrow$ I.O.P. After loss of Epithelium, stroma.



N.B Descematocele. Not Common in.

- ✓ Children Due to weak Descement Membran.
- ✓ hypopyon ulcer due to Posterior Absces.

④ Scar Formation.

- nebula
- Macula
- leucoma
- ✓ • Facet
- ✓ • Kerato ectasia.
- ✓ • Psudo Pterygium.

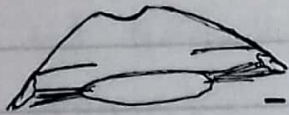
● Nebula :- Faint opacity
iris details visible.

* Macula

● Leucoma :- dense opacity.
iris details non visible.

~~Adherent~~

● Facet :-
- depressed scar lined with Epithelium.
- due to Rapid Regeneration of Epithelium
Than Healing of Stroma.



- Pooling of Fluorescein but not staining.

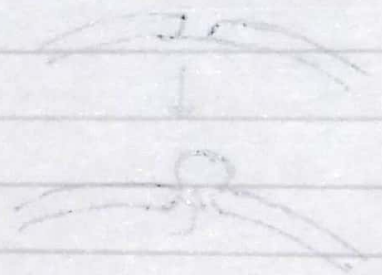
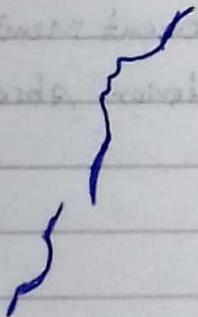
● Kerato ectasia :-
bulging of weak scar under effect of
I.O.P.

● Macula :-

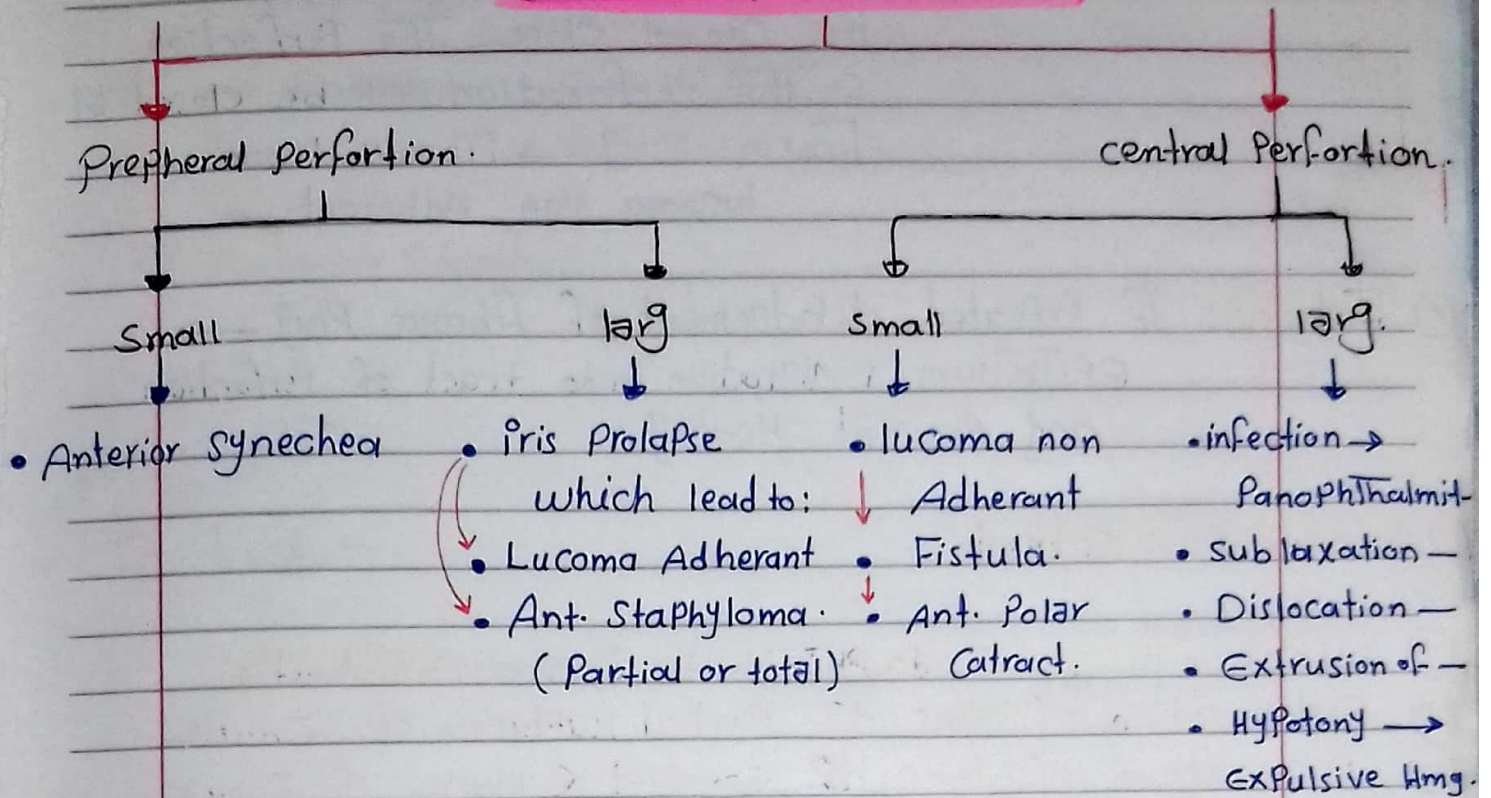
opacity of intermediate depth
iris difficultly seen through it.

● Pseudo Pterygium :-

Fold of Conjunctiva is Adherent to
base of corneal ulcer.



Complication with Perforation



- ① **Anterior synechia**:- Adhesion between Anterior surface of iris and back of cornea following small peripheral Perforation.
- ② **Iris Prolapse**:- Part of iris is Prolapsed Through large peripheral Perforation.
- ③ **Lucoma Adherent**:- Iris is incarcerated into Corneal scar C.C.C by (Pear shaped Pupil & irregular depth A.C)
- ④ **Anterior staphyloma**:- iris is incarcerated into Corneal scar that bulge forward result in closure of A.C Angle it may be.
 Partial → if peripheral Perforation.
 Total → if central Perforation.

⑤ Leucoma Non Adherent : occur in small central Perforation. iris cannot close the Perforation. So the Perforation will be closed by Fibrin Plug → Fibrous tissue → Leucoma Non Adherent.

⑥ Fistula : if Repeated dislodgement of fibrous Plug → Epithelium Migration into tract of Perforation and Prevent Healing.

⑦ Anterior Polar Cataract.

⑧ Infection → Endophthalmitis & Panophthalmitis.

⑨ Subluxation of lens & Partial Rupture of Zonule.

⑩ Dislocation of lens & Complete Rupture of Zonule.

⑪ Extrusion of lens.

⑫ Hypotony → Expulsive Hmg.

N.B

	Leucoma Non adherent	Leucoma Adherent
Causes	small central Perforation	large Peripheral Perforation
A.C	Regular	irregular
Pupil	Rounded	Pear shaped.
I.O.P	Normal	May ↑
Color	Not pigmented	May be pigmented.

Primary ulcer. include.

- ✓ (1) Hypopyon ulcer (Acute serPiginous ulcer)
- ✓ (2) Dendritic ulcer
- ✓ (3) HZO
- ✓ (4) Fungal ulcer
- ✓ (5) Acanthamoeba keratitis.
- (6) Traumatic ulcer
- (7) Ulcer with lagophthalmos.
- (8) Neuro Paralytic (neuro tropic) ulcer
- (9) Mooren's ulcer
- (10) Atheromatous ulcer
- (11) ~~ulcer with lagophthalmos~~
- (12) Kerato ~~malacia~~



Subject:

Date:

Keratomalacia

(nutritional ulcer)

def:- Bilateral Primary non infective ulcer and
Melting of Cornea due to acute vit A defic.

C.P

- (1) loss of Corneal luster Followed by.
Appearance of yellow dots due to
Epithelial degeneration.
- (2) Melting of cornea due to Necrosis
- (3) Corneal Hypoesthesia
- (4) iris Prolapse → total Ant. staphyloma
- (5) Corneal scarring.

!!!

[1] !!! of Hypo Proteinemia
(لان البروتين هوالى بيشيل Vit. A)

[2] larg dose of systemic Vit. A

[3] topical vit. A if no Melting.

[4] Fresh frozen Plasma (Ptn. carry vit. A).

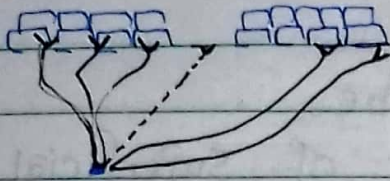
[5] Anti bacterial eye drop, ointment

[6] Covering of Corneal defect by

(conj. Flap)
Contact lens
Kerato Prasty.

Neuro Paralytic Keratitis (Neuro trophic ulcer)

def: Primary Corneal ulcer due to trophic changes which occur in Absence of Corneal sensation.



الـ (الـ) فيـا نـرـفـ
الـ Epithelium يـاـعـ

N.B loss of Corneal sensation. in case of Damage of ophthalmic nerve or its branches

- ▶ HZO
- ▶ Radical ttt of trigeminal neuralgia by Alcohol injection in trigeminal ganglion
- ▶ Sup. orbital fissure & orbital apex syndrome.
- ▶ Retro Bulbar injection of Alcohol
- ▶ Absolute glaucoma.

Symptoms. (P.B.P.L.H) Asusual +

- (1) Pain Absent
- (2) Marked drop of vision (central ulcer).

Sign.

large ulcer
Deep central ulcer
Corneal Anesthesia

*** usual ttt of Corneal ulcer +
→ long term bandage
→ Medial tarsorrhaphy.

Moorens ulcer

(Rodent ulcer of cornea).

(Chronic Serpiginous ulcer).

def:- Primary non infective Corneal ulcer
Common in old age

etiology:- unknown. May be.

→ ischemic Necrosis of superficial layer of cornea due to limbal vasculitis which lead to Release of Proteolytic enzyme from conjunctiva.

→ Auto immune disease.

Symptoms (P, P, B, L, H)

(1) Severe neuralgic pain

(2) Photophobia

(3) Blepharospasm

(4) lacrimation.

(5)

Sign.

→ Ulcer Start as Marginal gray infiltration. which breaks down to form creasent shape ulcer.

→ Advanced undermined edge. which creep towards center

→ Peripheral Heald Vascular Edge.



U.B

Serpiginous ulcer

- Hypopyon ulcer
- Fascicular ulcer
- Mooren's ulcer

Sever Pain ulcer.

- Fungal ulcer
- Mooren's ulcer.
- Hypopyon ulcer

III

- * Systemic steroid
- * ~ immuno suppressive.
- * Caution of ulcer befor^{or after.} Reaching to Pupil
- * Conjunctival excision. (↓ vascularization).
- * lamellar Kerato Plasty if opacity Present



Fungal Keratitis

- usually after wood-plant trauma
- caused by ✓ *Candida Albicans*
✓ *Aspergillus*.

Sign: ulcer characterized by (رأى القرنية متقدرة تحت ال Margin)

- (1) Has feathery margin
- (2) with satellite lesion.
- (3) Endothelium Plaque
- (4) hypopyon with irregular border.
- (5) Deep stromal infiltration



N.B

- * usually seen in Agricultural worker
- * PF:-

- ① Corneal Trauma with vegetable material
- ② Contact lens wear
- ③ bad hygiene
- ④ Abuse use of topical Antibiotic, steroid.

Acanthamoeba keratitis

"Protozoa"

"Protozoa living in Tap water or swimming pool"

→ 70% of cases are contact lens wearers
same symptom but with.

Symptoms:- Severe Pain with Proportion to degree of keratitis.

Sign.

- ✓(1) Start as Punctate or Pseudo dendritic keratitis —
- ✓(2) Para Central Partial or Complete Ring of Stromal infiltration.
- ✓(3) Radial keratoneuritis (Thickened ~~st~~ corneal nerves).

* Pseudo dendritic keratitis
* Para central stromal infiltration.
* Radial kerato neuritis.



N.B Pseudo dendritic keratitis ~~is~~ in Acanthamoeba
is diagnosed as herpes.

Pseudo dendritic Keratitis in HZO

Date: _____

sheet Herpes simplex keratitis Dendritic ulcer

def:- Primary superficial infective ulcer which has
Dendritic shape.

Causative agent :- HSV (TYPE I). < Epitheliotropic.
neurotropic.

Predisposing factor :- It may follow.

- ① Stress
- ② Fever, Common cold, influenza
- ③ depressed immunity
- ④ Abuse use of steroid.
- ⑤ After Menstruation.
- ⑥ U.V Ray.

Pathogenesis.

- Virus becomes dormant in Trigeminal ganglion
- Recurrence occur after decreases body Resistance.
- And virus become Active causing vesicle in cornea.

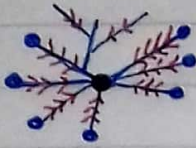
Symptoms:-

Same symptoms but with
Moderat Pain Due to hypoesthesia

- ✓ * Moderat Pain.
- ✓ * PLB (Photophobia, lacrimation, blepharospasm)
- ✓ * Redness
- ✓ * Defect vision if central -

Sign:-

- ① unilateral ulcer
- ② Typical dendritic ulcer characterized with



- ✓ • central
- Non vascularized.
- ✓ • linear
- ✓ • Branching
- Superficial (less scarring).
- ✓ • Terminal knobs
- + Recurrent
- Hypoesthesia

- ③ Double stain test:-

Rose bengal stain viral infected cell
Fluorescein stain ulcer bed.

Complication:-

→ ① Herpetic iridocyclitis

② Disciform Keratitis.

Due to Antigen Antibody Reaction in Corneal stroma.
with Stromal edema (hypersensitivity Reaction to viral Ptn.)

③ Amoeboid (geographical) ulcer.

Enlargement due to Topical steroid or ↓ immunity.

→ ④ Recurrence

⑤ Neurotropic ulcer (Keratitis neuroherpetic).

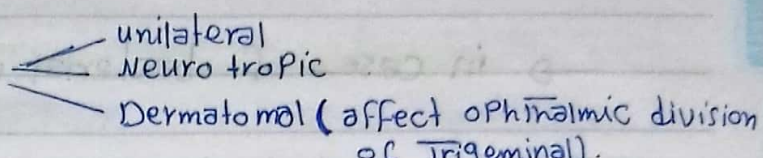
shedding of Epithelium Due to improper Healing.
Not Due to Recurrence of infection.

→ ⑥ Nebula if reach to Bowman's layer



Herpes Zoster ophthalmicus.

def:- Viral infection involve ophthalmic division of Trigeminal Nerve.

Causative agent:- VZV.
  unilateral Neurotropic
Dermatomal (affect ophthalmic division of Trigeminal).

Clinical Picture:-

(A) Skin Manifestation.

- severe Pain. Followed by.

- ✓ Erythema
- ✓ vesicles - Macule - Papule.
- ✓ Pustules
- ✓ scaring & crust
- ✓ Hutchinson sign

(Affection the tip of nose by Rash increases the Risk of Corneal Affection Due to both supplied by Naso ciliary nerve.)

← (B) Ocular Manifestation.

- ✓ Conjunctivitis
- ✓ Scleritis - Episcleritis
- lid (Erythema - vesicle - scaring).
- Keratitis e-

superficial Punctate Keratitis & Corneal Anaesthesia.
Pseudo dendritic keratitis without Terminal knobs
Keratitis Prof. + Prehval

- uveitis
- Rinitis.
- Neuritis (2, 3, 4, 5) → squint & optic neuritis.

(C) Post Herpetic Neuralgia.

ocular Manifestation.

lid

- Erythema
- Visicle
- Scaring.

Cornea.

- Corneal Anaesthesia
- Superficial Punctate Keratitis
- Pseudo dendritic Keratitis (with out terminal knobs)
-

Conj. ~~scars~~

- Conjunctivitis

Sclera

- Scleritis
- Episcleritis.

uvea

- uveitis.

Retina

- Retinitis

Nerve

- Neuritis (2,3,4,6)
 - ✓ Paralytic squint
 - ✓ optic Neuritis.

Subject:

Date:

Atheromatous ulcer

def: ulcer occur in Area of old leucoma

Characterized by.

- * Atheromatous Hyaline degeneration. with 2nd infection
- * bad Healing.
- * Commonly Perforated.

N.B Complete loss of Corneal Sensation.

- ✓ * (1) Neuro Paralytic Keratitis.
- ✓ * (2) Complete Trigeminal Nerve damage.
- ✓ * (3) Absolute glaucoma.
- ✓ * (4) ~~HZO~~

Causes of impaired Corneal Sensation.

- (1) Herptic Keratitis. (Dendritic ulcer) &
- (2) Acute Congestive glaucoma.
- (3) Affection of ophthalmic division.
- (4) Cavernous Sinus Thrombosis.
- (5) Keratomalacia.

~~(6) ~~Herpetic~~~~

Exposure Keratitis.

(ulcer of lagophthalmos).

def:- Primary non infective corneal ulcer in lower 1/3 of cornea caused by corneal exposure

etiology:- lagophthalmos (moderate to severe) → dryness of cornea → erosion of epithelium

symptoms. P, P, B, L, H

⊗ Haze as no diminution of vision because it's peripheral ulcer.

Sign

→ lagophthalmos

→ Ulcer at lower 1/3 of cornea with straight upper border.

⦚

ocular bandage.

lubricating eye drop.

Anti bacterial (Prophylactic).

⦚ of lagophthalmos.

~~⦚~~ usual ⦚ of corneal ulcer.



!!! of Corneal ulcer

(A) Essential Therapy

- Anti Microbial if infective ulcer

→ in case of bacterial ulcer

① Topical Anti biotic

- (1) Fluoroquinolones

• oflox

• ciprofloxacin

کی غن و قایق کے لئے
درجہ ۱ کی دوا ہے
درجہ ۲ کی دوا ہے
Response

- (2) Fortified Anti biotic (in Resistant ulcer).

② systemic Anti biotic needed if

- ✓ limbal or scleral involvement
- ✓ Perforated ulcer.

③ sub Conjunctival Antibiotic

→ in case of viral ulcer

- (1) Acyclovir 3 % eye ointment 5 Times / day
(2) Vidarabine 3 % eye ointment 5 Times / day.
(3) Trifluorothymidine 1 % eye drops every 2 hours.

→ in case of fungal ulcer

- (1) Amphotericin B 0.3 %
(2) Miconazol 1 %
(3) Natafmycin 5 %

→ in case of Protozoal ulcer

- (1) Brolen eye drop and ointment
(2) Neomycin

2 Corticosteroid in non infectious corneal ulcer.

N.B → steroid are absolutely contraindicated in infective keratitis
As it may lead to :-

- Promote bact. fungal, viral growth
- lowering Resistance.
- Delay Healing.
- Promote Perforation.

2 Adjunctive Therapy :

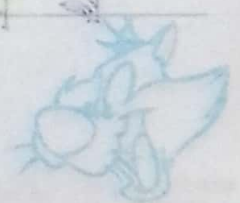
- Atropin sulphate (mydriatic cycloplegic) → ↓ Pain.
+ dilation of Pupil → ↓ synch. counter irritation
- Dark glasses
- Hot fomentation. (V.D → improve circulation & ↓ Pain)
- Analgesic.
- Vitamin A & C → important for Healing of stroma.
↳ important for Healing of Epithelium

3 Promote Re-Epithelialization.

- Lubricant
- Bandage if never discharge → Promote Epithelialization
- Soft Contact lens. → ↓ Pain (avoid irritation by lid)
→ avoid irritation of iris by light.)

4 Removal of necrotic material

- scraping or debridment
- Cauterization.



5 Prevention of Perforation:

- Paracentesis. (Puncture of Ant. chamber and Evacuation its Content).
- Conjunctivo Plasty → (Pseudo Ptygium).
- Kerato Plasty.
- Tissue adhesive glue.
- Ascorbic acid.

6 Ht of complication.

► 2nd Glucoma :-

- Anti Glucoma Medical Ht.
- Paracentesis in Resistant cases.

► Descemato cele

- Rest.
- Avoid strain.
- Anti glaucoma Therapy.
- Paracentesis.

► Perforation

As Above → Closure of Perforation

small Perforation → Tissue Adhesive glue

large " → Conjunctival flap or Kerato Plasty

► Fistula

Destruction of Epithelium line Trake of fistula.

▶ **Nebula** $\begin{cases} \text{Peripheral} \rightarrow \text{Astigmatism} \rightsquigarrow \text{Hard Contact lens.} \\ \text{central} \rightarrow \text{opacity} \rightsquigarrow \text{lamellar Kerato Plasty.} \end{cases}$
 • Rigid Contact lens if irregular Astigmatism.

▶ **leucoma non Adherent (central)**.
 Deep lamellar or Penetrating kerato plasty.

ttt. of: Resistant Corneal ulcer

- (1) scrap Edge of ulcer for culture and sensitivity.
- (2) Debridement
- (3) cauterization
- (4) Sub conjunctival injection of Antibiotic.
- (5) fortified Antibiotic
- (6) systemic "
- (7) Paracentesis
- (8) Conjunctival flap.
- (9) Kerato plasty.

(3) Conjunctival flap or amniotic Membran graft.

Indication • ttt Perforation
• Prevent Perforation.

Value (1) ↓ Complication of Perforation
(2) Prevent Perforation
(3) supply ulcer with fibroblast

① Cauterization.

m To kill organism.

Types

- ① Acute cautery
- ② Chemical cautery :- using.
 - Pure carbolic acid → Hypopyon ulcer
 - Iodine, Alcohol → Dendritic Ulcer
 - Zinc sulphate 20% → Morax liquifacans ulcer

② Paracentesis

def Puncture of A.C & Evacuate Form Pseudo Pterygium.

Indication

a) Therapeutic

- in corneal ulcer
- To ↓ I.O.P $\begin{cases} \text{ttt CRAO} \\ \text{before intra ocular injection} \end{cases}$
 - To P $\begin{cases} \text{to ttt 2nd glauc} \end{cases}$

b) Diagnostic

- To obtain aqueous sample in
- * intra ocular infection
 - * intra ocular Tumor

④ Tarsorrhaphy

⑤ Cross linking

⑥ Therapeutic keratoplasty.

- ① stop treatment ~~and~~ ② scrap Edge of ulcer for culture sensitivity.
- ③ Consider Conjunctivitis (as is may be The source of infection)

Sheet

Fistula (def - diagnosis - Management)

def:- Migration of Epithelium into tract of Perforation.
Preventing the Healing.

Etiology:- Small, Central Corneal Perforation.

diagnosis:-

- (1) +ve River Sign.
- (2) Absence of Ant. chamber
- (3) Very Soft Tension.

Management

- (1) Hospitalization and avoid straining.
- (2) destruction of Epithelium lining the tract.
- (3) Cauterize edge and Trake of Fistula.
- (4) Conjunctival flap. if larg.
- (5) or Kerato Plasty if larg fistula.
- (6) Tissue Adhesive glue if small
- (7) ~~Res~~

Complication:-

Hypotony → Macular Edema.
infection → Pan ophthalmitis.
Flat A.C → Cataract (Ant. Polar cataract)
PAS → 2nd Glaucoma

Sheet

Acute hypopyon ulcer (Acute Serpiginous ulcer)

def:- Primary infection Acute severe superficial suppurative keratitis. Associated with severe iridocyclitis and hypopyon or disc shape ulcer Associated

Causative agent:-

Typical → 80% of case Pneumococci
Atypical hypopyon ulcer → 10% " " Morax - Axenfeld.
10% " " Strep - Staph - Pseudomonas.

Commonest source:- dacryocystitis.

Predisposing factor:- Corneal Abrasion. (as before).

Symptoms:- Same symptom but with severe pain.

Sign

- Paracentral disc shape ulcer with loss of Transparency.
- Has tendency to Extend central And deep.
- Central Edge undermined and Progressive. Surround by inflammatory cell
- Prepheral Edge vascularized and Regressive. Surrounded by less inflammation.
- Perforation is Common without descemato cele. formation due to early destruction of Descemet Membran.
- Associated with Posterior Corneal Abcess
- 2nd glaucoma is Common.

Complication

- (1) iridocyclitis
- (2) 2nd Glaucoma
- (3) Perforation is Common
- (4) Descemato cele is Rare ?!
- (5) fistula is Rare
- (6) Corneal opacity.

N.B

Vascularized = serpiginous

def:- Progressive Central or Paracentral Stromal Thinning of Cornea leading to Ectasia and apical Conical Protrusion due to weakness of Stromal Collagen.

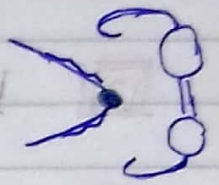
Age:- start around Puberty. with Progressiv Cours.

- Bilateral
Associated with

- Spring Catarrh.
- Retinitis Pigmentosa.

symptoms:-

- ① gradual painless drop of vision.
- ② Myopia.
- ③ irregular Astigmatism.
- ④ frequent change of distant glasses
- ⑤ intolerance to Contact Lenses
- ⑥ Central opacity.



sign:-

- ✓ ① Placido disc used to detect corneal Astigmatism.
- ✓ ② Kerato Meter (irregular astigmatism < 45 D).
- ✓ ③ Corneal Topography (The Cone appear as Red spot).
- ✓ ④ Retinoscopy (Rotatory) Reflex.
- ✓ ⑤ Ophthalmoscope (oil droplet Reflex).
- ✓ ⑥ Fuchs's Ring (iron deposition in basement membrane of cornea)
- ✓ ⑦ Munson's Sign (Angulation of lower lid. when looking down).
- ✓ ⑧ Vogt's Striae (vertical line in stroma)



Complication:-

1] Acute hydrops.
(Acute Corneal Edema due to breaks in Descemet Membrane).

2] Corneal scarring.

III:-

1] Collagen Cross linkage :-
using Riboflavin and U.V Ray to enhance collagen cross linkage.

2] Hard Contact lens. for irregular Astigmatism.

3] intra corneal Ring segment
(INTACS, Kera, Ferrara)

4] in Corneal opacity.

→ lamellar kerato plasty.

5] → Penetrating kerato plasty.

eye Rubbing. - keratoconus - opacity.



- collagen cross linkage
- Hard contact lens
- intra corneal Ring.

✓ Anti Histamine

Mast cell

Stabilizer

lamellar kerato plasty.

penetrating kerato plasty

D.D

Large Cornea at birth

- (1) buphthalmos
- (2) Congenital Myopia.
- (3) Megalocornea.

D.D

Red eye.

- (1) Acute iridocyclitis.
- (2) Acute Conjunctivitis.
- (3) Acute Primary Congestive Glaucoma
- (4) Acute Keratitis
- (5) Dry eye.

D.D

Moving ulcer in Cornea.

- (1) Typical hypopyon ulcer
- (2) Mooren's ulcer
- (3) Fasicular ulcer

D.D

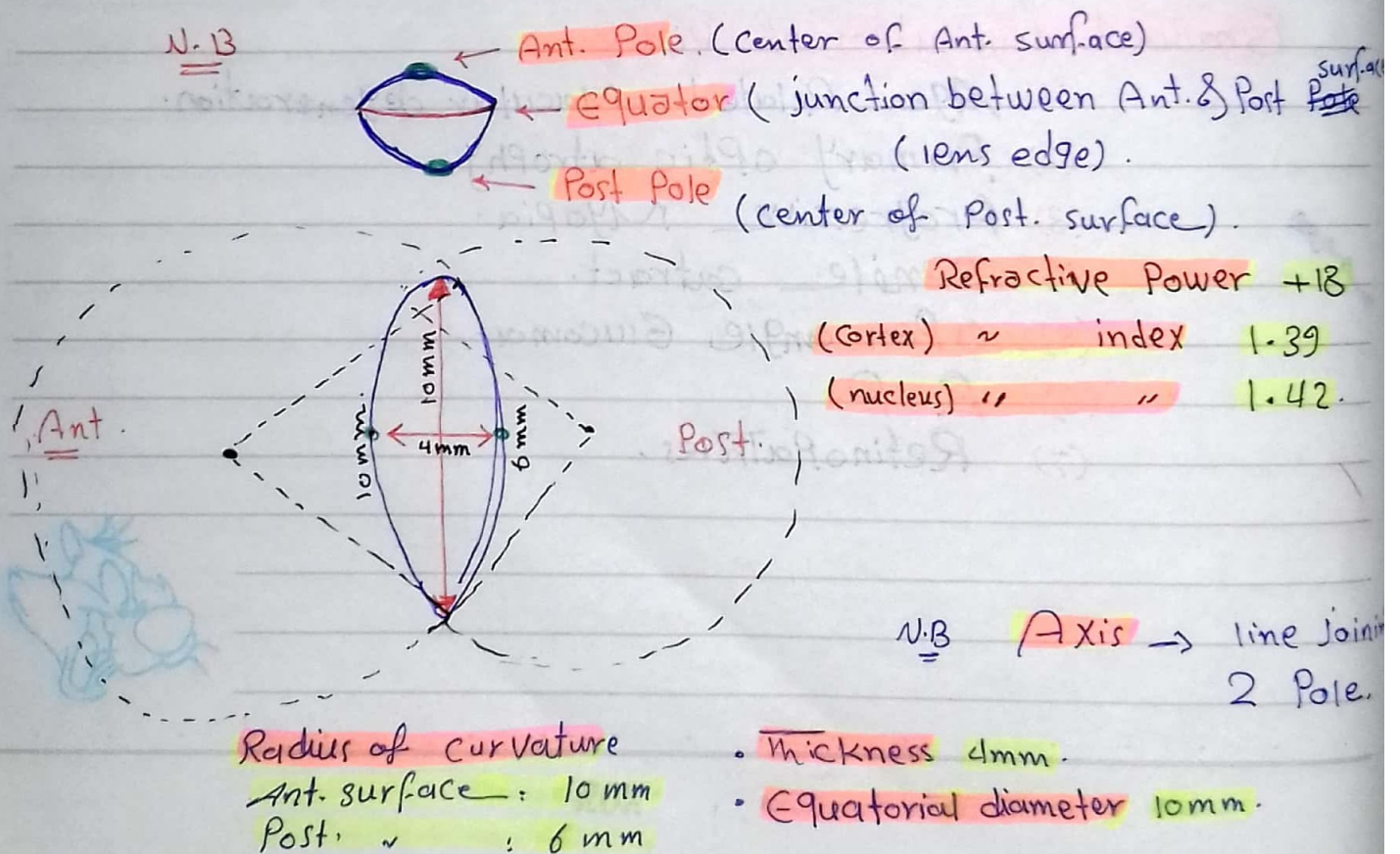
Hallow around light

- (1) Corneal Edema.
- (2) Mucopurulent Conjunctivitis
- (3) incipient stage of cataract
- (4) Acute Congestive Glaucoma -

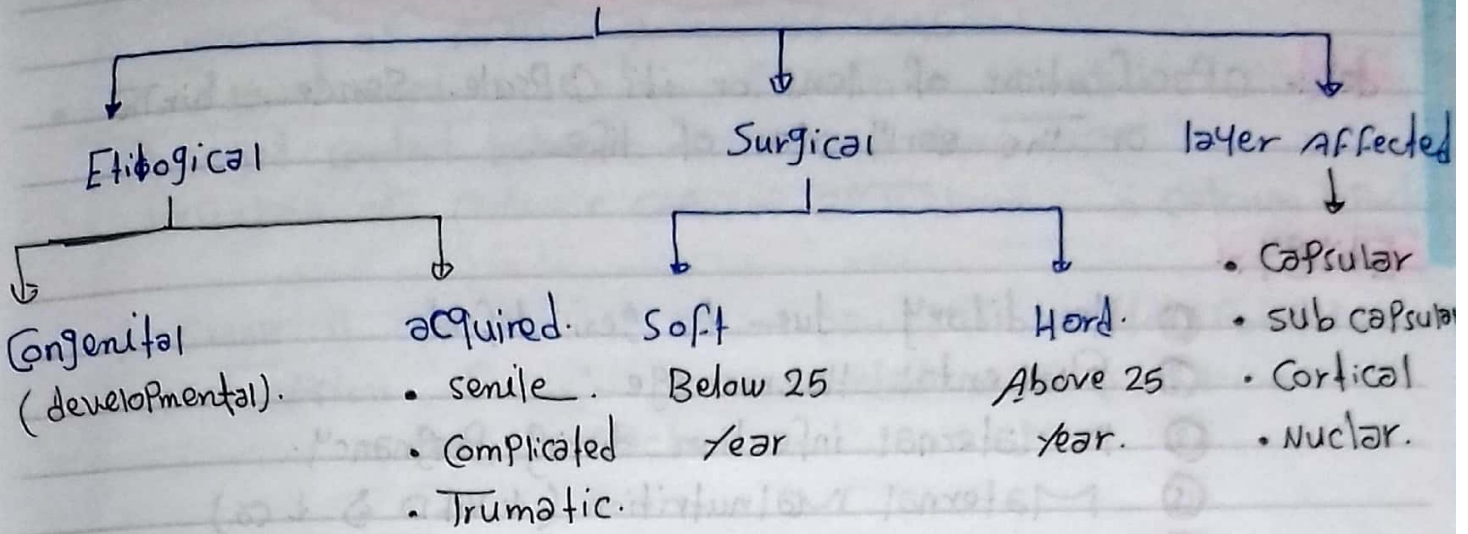
- * arcus senilis ?!
- * Kerato plasty (indication & complication).

.. lens ..

- (1) Gradual Painless diminution of vision (causes).
- (2) Sudden loss of vision (causes).
- (3) Senile cataract (C.P - clinical stage - Comparison of Hyper mature stage - intumescent stage).
- (4) Complicated cataract. (Aetiology - C.P - causes - Ht)
- (5) Complication of Extracapsular cataract extraction.
- (6) Congenital cataract (Type - Ht - causes - Management).
- (7) Soft cataract (causes - C.P - Management.)



Classification of cataract



Function of lens:-

- (1) second eye Refractive medium.
- (2) Protect Retina from UV Ray
- (3) Accommodation.

1] Trauma.

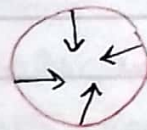
- 2] Vascular
- CRAO
 - Fuch's spot
 - Vit. Hmg.

3] amaurosis Fugax 3P

- Papilledema
 - Prodroma of CRAO
 - Postural Hypotension.
- Relaxation

N.B

→ Ciliary muscle.



Contraction

Zonule.

Relax.

Contraction

lens.

More spherical

Flattens.

MCO N.B embryology of lens From surface ectoderm

وذا الى يفسر لـ بعض الامراض في العين مرتبطة بالامراض الجينية

Congenital cataract is developmental.

def: Opacification of lens or its capsule since birth or the early year of life.

Etiology:-

- ① Hereditary due to gen defect.
- ② Placental Haemorrhage.
- ③ Maternal infection during pregnancy.
- ④ Maternal malnutrition ($\downarrow$ vit. D & $\downarrow$ Ca)
- ⑤ Maternal Hypoxia
- ⑥ Metabolic as galactosemia
- ⑦ Teratogenic as (drug & irradiation).

Types:- [A | P | R | B . C]

- (1) Anterior Polar
- (2) lamellar or Zonular cataract
- (3) Posterior Polar
- (4) Rubella (total) cataract
- (5) Blue dot $\longrightarrow$ (6) Sutural cataract
- (7) Coronary cataract
- (8) Combined type.



1) Anterior Polar Cataract

opacity at Anterior Pole of lens.

- Due to delayed formation of Anterior chamber → Prolonged Contact between Cornea and lens with → irritation of Anterior capsular Epithelium → Calcium deposition
- if Small it Not affect Vision (away from Nodal Point).
- affect vision if large or associated with posterior Polar cataract.

D.D of Anterior Polar cataract

Congenital	Acquired.
usually bilateral At birth	unilateral Any Age. Central Perforation Central laceration in cornea

N.B
hour glass opacity
(dt. Persistent Fibrosis
Connection between cornea, lens
Pyramidal cataract
الجزء الذي ينفصل والذي تحت يبقى

2) Posterior Polar Cataract

- Disc shape opacity at the Posterior Pole.
- Associated with Persistent of hyoid Remnant.
- Marked affect vision (near to Nodal Point).

شفاوي

[3]

Lamellar cataract



- * Commonest type of congenital cataract
- Central disc shape with spokes like steering wheel of ship.
- opacification involve one or more lamellae of lens with clear fiber in between.
- it associated with ~~hypo~~ Maternal Hypo calemia and vit. D deficiency.
- The child may show Rickets and abnormal enamel Teeth
- * usually bilateral, symmetrical

[4]

Rubella (total) cataract

- Due to infection of Mother During 1st Trimester
- occur in 15 %
- Cataract surgery should be PostPond to 2-3 year To avoid Pos operative uveitis.
- Associated with:-
 - ✓ microcephaly
 - ✓ P. D A
 - ✓ Deafness.
 - ✓ Micro ophthalmous.
 - ✓ interstitial Keratitis
 - ✓ Buphthalmous
 - ✓ Retinopathy.

[5]

Blue dot

- Multiple small opaque dots scattered All over The lens
- doesn't Affect vision.

[6]

Sutural

Small dots fuse together in V shape sutural.

[7] Coronary type



- club shape opacity surround nucleus like a crown
- Not affect vision.

[8] Combined type :-

[9] Nuclear type :-

- Confined to embryonic or fetal nucleus.
- Central oil droplet cataract
- Associated with Glactosemia.

Symptoms :- Reported by Mother :-

- (1) leucocoria (white Pupil).
- (2) Defect in vision
- (3) Squint
- (4) ~~N~~ Nystagmus.

Sign :-

lens is examined through dilated pupil under general Anesthesia.

- (1) slit lamp examination show level of opacity.
- (2) Coaxial illumination show dens opacity as dark area against Red Reflex.
- (3) Oblique illumination show grayish white opacity in lens.
- (4) fundus examination should be done to exclude Retinal Anomalies.
- (5) serological investigation for intra uterine infection.
- (6) lab test to exclude glactosemia.
- (7)

(7) Measuring Visual Acuity According Age.

- looking test in Pre Verbal children.
- occlusion crawling.
- optokinetic nystagmus test for young and Mentally Retarded.
- chart
 - ✓ Picture Visual chart
 - ✓ ordinary chart for older children.
- Visual Evoked Potential (VEP).

Complication of Congenital cataract

In Bilateral case

- Nystagmus
- Mental Retardation.

in unilateral case

- Amblyopia
- squint

عنايه بعمل الصورة الى مشكوكه
عنايه ال brain يبادل يركه لعيه عكس
نبتا cataract عنايه يصل الى صفة
نوضع ← Nystagmus
طبيب ال MR انوي ندر ال LR
الوظائف ال brain يصل لعين
يصل squint

① Management of Congenital cataract

In Dens cataract (3mm or more)

if unilateral must be Removed early as possible to avoid Amblyopia and squint.

if Bilateral should Removed within the first few months of life.

- * if Bilateral with Asymmetric density start with denser eye to avoid amblyopia.
- * if Bilateral with symmetric density. operation early as possible before 2 month to avoid fixation nystagmus.

In Faint Congenital cataract (uni or Bilateral).

Surgery often made when the best corrected visual acuity less than $\frac{6}{18}$

($\frac{6}{18}$ with accommodation is better than $\frac{6}{6}$ without accommodation)
الدكتور سألني قالي ممكن أشيل للمريض ال cataract وهو نظرة $\frac{6}{18}$ ويبقى $\frac{6}{6}$ ستفوى
ليه مخلصش إعلية من الحالة دي؟ طبعا! اتبسط لها قوالبه الإيجابية دي

In children more than 8 year

Surgery is Recommended when child has difficulty functioning in school, sports and his normal activities.

2 Type of surgery

1) irrigation - Aspiration technique.

(with Primary posterior capsulotomy and Anterior vitrectomy)

2) Lensectomy.

(Removal of whole lens and its capsule)

في حالات لو فيه Congenital Problem فال vitreous بشيل

ال vitreous وال lens

3 Visual Rehabilitation.

before 1 year

after 1 year

- Post operatively C.L or glasses
- Primary implant of I.O.L
- later on : secondary implant of I.O.L

4 Amblyopia.

* Cover method.

Complicated cataract

def:- lens opacity due to local diseases in eye.
or systemic diseases in the body.

Etiology:-

ocular cause.

- 1 Central Corneal Perforation → acquired Anterior Polar
- 2 Chronic uveitis.
- 3 subluxation or dislocation of lens.
- 4 intra ocular Tumor (Retinoblastoma & Melanoma)
- 5 Retinal detachment
- 6 Retinitis Pigmentosa
- 7 Acute Congestive glaucoma
- 8 Absolute glaucoma.

RACS
↓ ↓ ↓

systemic cause.

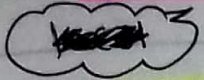
- 1 D.M.
 - Presenile cataract (similar to senile but younger age)
 - True diabetic (Snowflake cataract).
in younger uncontrolled diabetes.
- 2 Hypo parathyroidism.
- 3 Hypo thyroidism.
- 4 Glucosemia
- 5 Heavy Ankylostoma infection.
- 6 irradiation (infra red & x-ray)
- 7 systemic Drug as steroid and ergot.
- 8 toxin as naphthalen.

NB mechanism of complicated cataract is interference with lens metabolism.

Characteristics (clinical picture).

- 1 Posterior Cortex is Affected early Due to
 - Thin capsule
 - No Posterior Epithelium.
- 2 Progressive
- 3 Polychromatic luster due to diffraction of slit lamp light by deposition of cholesterol crystals.
- 4 Calcium deposition giving chalky white appearance (late)
- 5 ^{Presence} Evidence of cause as KP in uveitis, LPs, post synechia
- 6 Disproportionate drop of vision to density of cataract.

Management :-



- (1) in case of uveitis :- Ht inflammation at first and wait for 3-6 months before cataract extraction
- (2) in case of D.M :- There is a Risk of Hmg. & infection & delayed Healing.
- (3) in case of glaucoma operation either done separate or Combined.
 - Glaucoma operation first and 1-3 month later do cataract.
 - Combined glaucoma & cataract operation.
- (4) High Myopia :- Do (ECCE) due to fear of vitreous loss.
- (6) Control general diseases before cataract extraction.

Surgery

Depend on age.

Soft

Removed by

- irrigation - Aspiration.
- lensectomy.

Hard

As senile cataract.



Trumatic cataract

def:- lens opacification due to lens injury.

Etiology :-

1 Blunt Trauma

occur due to Rupture of Posterior capsule.
Allowing Entry of Aqueous. with break down
of lens Ptn.

site :- Post. capsule.

Character

- (1) start Posterior sub capsular.
- MCC (2) Rosett or feathery shape.
- MCC (3) Vossius Ring. (Ring of brown Pigment on Anterior capsule. due to Pressure of Pupillary border of iris on lens.
- (4) Progressive.

2 Perforating trauma :-

Due to capsular Rupture. & lens Ptn. escape to Anterior chamber leading to :-

- 1- severe uveitis
- 2- Secondary Glaucoma.

3 intra ocular foreign body.

Iron	→	siderosis bulbi/siderotic cataract ± Rust Spot. in Ant. capsule
Copper	→	chalcosis bulbi (sun Flower) cataract

4 irradiation :-

X-Ray & infra Red.

:-

- (1) Pre operative examination and u.s if cataract dens. :-
→ to detect other effect of Trauma (Hmg. - RD - IOFB)
- (2) Medical ## :- Topical steroid And Atropin.
in case of uveitis.
- (3) Surgical ## :- wait till eye is quite (no uveitis & No Glaucoma)
- (4) Follow up to
 - detect late effect of trauma.
 - fear of sympathetic ophthalmitis.



ROX

N.B

unilateral cataract :-

Causes

- 1- Traumatic cataract
- 2- Complicated cataract (local disease)
- 3- Senile (one precedes the other)
- 4- Rare Congenital

Problems :-

- 1- glass cannot correct unilateral Aphakia due to
→ Aphakic eye need lens which magnify 30%
image while other eye normal
→ difference in size of 2 image. The brain.
unable to fuse it → binocular diplopia.

It :-

- ☐ Contact lens
- ☐ I.O.L
- ☐ Cataract extraction.

N.B

Phakia = Normal lens

Aphakia = No lens

Pseudo Phakia = آسيب

" Senile Cataract "

def:- Progressive lens opacity affecting old people in absence of ocular or systemic disease or drug.

character:-

- Acquired
- Bilateral
- Progressive.
- Hard.

Age:- Above 50 year

Etiology :- unknown but may be

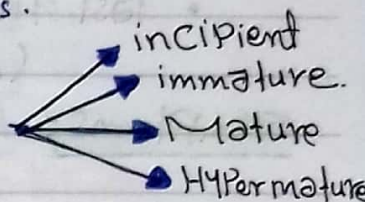
- Metabolic disturbance
- (disturbed capsular permeability)
- ↓ anti oxidant
- UV Rays.

Classification (Types).

① - Senile Cortical cataract

② - Senile Nuclear cataract

③ - Cortico Nuclear



Senile Cortical cataract.

Stages:-

① - incipient

② - immature

③ - Mature

④ - Hyper Mature

intumescent
(swollen).

Morgagnian
liquified cortex
nucleus blank.

Symptoms

- white Pupil
- Decreases vision (gradual Progressive Painless).
- if 2nd Glaucoma (Rapid Painful drop of V.A).

Incipient stage :-

- opacity at the periphery of lens surround nucleus
- wedge shape opacity.
- Apex towards center.
- Not markedly affect vision.



Immature stage :-

- lens is not totally affected.
- last fiber to be affected are ^{Ant.} subcapsular fiber.
(Newly formed fiber).

Symptoms :-

- (1) Halos around light (فيديو water vacuoles) (لأن ينقسم الألوان الأبيض)
- (2) Fixed Musca.
- (3) unioctar diplopia
- (4) Night blindness (Preperet) (dilatation في الليل فيظلم) (لأن يصل)
- (5) Hypermetropic shift
- (6) irregular Astigmatism (dt. difference in Refractive index between fiber).

Sign :-

(1) Slit lamp examination :-

lens → show grayish sectors

A.C → Normal

Capul → Normal

iris shadow → Present . iris → Normal

(2) Red Reflex :- black shadow against Red background.

(3) I.O.P :- Normal

Mature stage:-

- lens totally opaque.

Symptoms:-

Decreases vision (Hand movement).

Sign:-

(1) Slit lamp examination :-

lens —→ white.
A.C —→ Normal
capsul —→ Normal
iris shadow —→ Absent
iris —→ Normal

(2) Red Reflex :- Absent

(3) I.O.P :- Normal.

Hyper mature stage:-

- lens loss water and degenerated —→ Shrinks.

Symptoms:-

Drop of vision (Hand movement).

Sign:-

(1) Slit lamp examination :-

lens —→ totally opaque, shranked.
A.C —→ Deep **
capsule —→ wrinkled with ca & cholesterol deposit
iris shadow —→ Tremulous iris. **
iris shadow —→ Absent.

(2) Red Reflex :- Absent

(3) I.O.P. :- Increases (Phacolytic Glaucoma)

Complication of hypermature shrunken:-

- (1) Phaco-toxic uveitis (due to leakage of degenerated lens Ptn.)
- (2) Phacolytic Glaucoma (leaking Ptn engulfed by macrophage. And trapped in Trabecular M $\rightarrow$ 2nd Glaucoma)
- (3) Subluxation of lens due to degeneration of Zonule.

N.B

Intumescent lens

lens become swollen due to break down of lens Ptn. $\rightarrow$ $\uparrow$ osmolarity $\rightarrow$ ~~absorb~~ Absorb water $\rightarrow$ swollen.

Symptoms:-

- (1) Decrease of vision.
- (2) ocular Pain & Headch.

Signs-

(1) Slit-lamp ~~illumination~~ examin.:-

lens $\rightarrow$ Swollen & show water vacuoles

capsule $\rightarrow$ Stretched.

A.C. $\rightarrow$ Shallow **

iris shadow $\rightarrow$ (Pushed) may present.

(2) R.R $\rightarrow$ May be seen.

(3) I.O.P $\rightarrow$ increases (Phacomorphic glaucoma). *in eye*

Morgagnian type :-

- it is the typical picture of hyper mature cataract
- nucleus ~~think~~ sink by gravity in liquefied fluid in the lower portion of lens.

	immature	intumescent	mature	Hyper mature
Symptom (Vision)	↓	↓↓ (C.F & H.M)	↓↓↓ H.M	↓↓↓ H.M
Sign.				
→ lens	sectorial	sectorial + H ₂ O	total	shrunken.
→ Capsul	Normal	stretched.	Normal	wrinkled, thin
→ A.C	Normal	shallow	Normal	Deep.
→ iris shadow	Present	May Present	Absent	Absent
→ iris	Normal	Normal	Normal	tremulous
R.R	Seen	Seen	Absent	Absent
I.O.P	Normal	May ↑	Normal	May ↑
III	ECCE	Ecc E	ECCE	ICCE/ECCE

unilateral diplopia

- ① iridodialysis
- ② big peripheral iridectomy
- ③ Congenital Polycoria (multiple pupils) Cortical cataract
- ④ incipient stage of senile Cortical cataract
- ⑤ subluxated lens.

binocular diplopia

- ① Anisometropia corrected by Glasses
- ② Anisometropia more than 4D
- ③ Paralytic squint.
- ④ Restrictive myopathy
- ⑤ incipient stage of senile Cortical cataract.

D.D Tremulous iris ?? ***

Senile Nuclear Cataract

Pathogenesis:-

Exaggeration of Physiological sclerosis of the nucleus with age. with loss of transparency.

Grade :-

I Gray

II Yellow

III light brown.

IV brown or black.

Symptoms :-

- (1) Day blindness
- (2) Index Myopia (dt. ↑ R.I of nucleus).
- ✓ (3) decrease of vision.
- ✓ (4) fixed  luscæ.
- ✓ (5) unilocular diplopia.
- ✓ (6) 2nd Sight (improvement near vision).
Patient can Read without Reading glasses.

Sign :-

(1) oblique illumination :-

lens → Central opacity.

capsule → Normal

A.C → Normal

Iris shadow → Present.

(2) R.R Dark central disk in Reddish back ground.

(3) I.O.P Normal.

of senile cataract :-

Surgical → lens Extraction.

Type of Surgery ?!

- (1) intra capsular cataract Extraction. (ICCE)
- (2) Extra " " " (ECCE).

which eye ?!

More Advanced stage. Except in intumescent stage due to 2nd Glaucoma (urgent operation)

Time ?!

when the Patient unable to do his normal Activities.

ECCE	ICCE
* limbal incision * Capsulectomy (Removal of Circle area from ant. capsule) * Nucleus Removed by → delivery Through large Section 6-8 mm. → Phaco emulsification → Phaco laser * Irrigation - Aspiration by using double way cannula * Implantation of I.O.L (Post. chamber) * Closure of wound.	* limbal incision. * Peripheral iridectomy to avoid pupillary block by vitreous * lens extracted within the Capsule. * implantation of IOL (Ant. chamber as no capsule) * Closure of wound.

Ectopic lens :-

Subluxation of lens

def :- Partial ^{displacement} ~~displacement~~ of lens within pupillary area due to Partial tearing of Zonule.

Etiology :-

Congenital :- Marfan's Syndrome

Acquired :-

- Trauma
- Hyper mature cataract
- High axial myopia
- Buphthalmos (Congenital Glaucoma)
- Pseudo exfoliation syndrome.

Metabolic :- Homocystinuria

Symptoms :-

- 1] Drop of Vision. Due to
- ✓ Myopia (↑ lens curvature).
 - ✓ Astigmatism (lens tilt).
- 2] Aphakic Portion.

Aphakic Portion ✓ Hyper mature shift.

2] Unifocal diplopia.

- if edge of lens cross Pupil two image will form one from Phakic and the other from aphakic Portion.

Sign :-

- (1) A.C → irregular depth
- (2) iris → Tremulous
- (3) lens → Edge may be seen.
- (4) Slit lamp may show vitreal Hemation through pupil.

Complication :-

- (1) Cataract
- (2) Dislocation
- (3) Uveitis.
- (4) Secondary glaucoma.

III :-

- (1) if no complication →
- (2) lens extraction if complication by either
 - ICCE + ant. vitrectomy. (Adult).
 - lensectomy. (children).

Causes of tremulous iris

- ① Hyper mature senile cataract
- ② subluxated lens
- ③ Posterior dislocated lens
- ④ Aphakia.
- ⑤ Congenital Glaucoma
(Buphthalmos)

Dislocation of lens

✓ **def.**:- displacement of lens due to total tearing of Zonules

✓ **Etiology.** - As subluxation.
 Congenital
Traumatic
Metabolic

✓ **Types.** - (1) Ant. dislocation.
(2) Post "

Ant. dislocation

G.P

- lens becomes Spherical
- Resembles globule of oil in A.C.

Complication:-

- (1) Corneal Endothelial damage. → Corneal Edema
 - (2) 2nd Glaucoma due to Pupillary block (Glaucoma inversus)
 - (3) Cataract
 - (4) Iridocyclitis.
- Glaucoma that worsen by Miosis.

##:- immediate lens extraction with ICCE

N.B Axial lens of eye detect power of lens.

N.B Abuse use of corticosteroid result in post-subcapsular cataract

N.B Congenital subluxation of lens called ectopia lens.

N.B M.C complication of exfoliation of lens capsule is Conjunctivitis.

Posterior dislocation

Symptoms:-

- (1) Drop of vision due to hypermetropic shift.
- (2) No accommodation

Signs :-

(1) Deep A.C

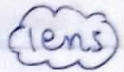


(2) Tremulous iris

(3) iridocyclitis

(4) 2nd glaucoma

(5) lens can be seen by ophthalmoscope.



Complication :-

(1) 2nd glaucoma

(2) uveitis

(3) cataract

N.B eye remain quite if the capsule remain intact



(1) if quite → correction of aphakia

(2) if complication occurs lensectomy.

+ vitrectomy.

N.B Tremulous iris.

* Hypermetropia.

* subluxation of lens

* Post-dislocation.

N.B Tremulous = iridodonesis.

تأثيرات الجراحات

Post operative Complication of Cataract surgery.

- (1) P.C.O (Posterior capsule opacification) most common
- (2) Endo Phthalmitis.
- (3) Retained lens cortex Result in → Uveitis
- (4) large incision Result in → secondary glaucoma
Astigmatism.
- (5) Wound or Suture Problem (suture Abscess)
- (6) iris Prolapse.
- (7) Vitreous loss
- (8) Drawn up Pupil due to Vitreous loss. تقلص حدقة العين
- (9) Retinal detachment ~ ~ ~ (late Complication)
- (10) Corneal edema
- (11) Delayed Formation of A.C.

late Complication

- ✓ • Retinal detachment
- ✓ • Macular edema.
- ✓ • Epithelial cyst in A.C
- ✓ • Aphakic glaucoma.